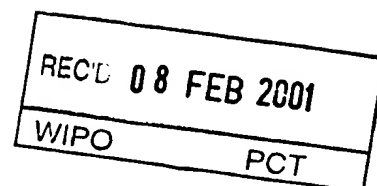


## PATENT COOPERATION TREATY

## PCT



## INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

15

Applicant's or agent's file reference 49161	<b>FOR FURTHER ACTION</b>	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)
International application No. PCT/FI99/00910	International filing date (day/month/year) 01/11/1999	Priority date (day/month/year) 02/11/1998
International Patent Classification (IPC) or national classification and IPC B32B27/10		
Applicant STORA ENSO OYJ		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 4 sheets, including this cover sheet.

- ☒ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of 2 sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☐ Certain defects in the international application
- VIII ☐ Certain observations on the international application

Date of submission of the demand 16/03/2000	Date of completion of this report 06.02.01
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer Schambeck, W Telephone No. +49 89 2399 2135 

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00910

## I. Basis of the report

1. This report has been drawn on the basis of *(substitute sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to the report since they do not contain amendments (Rules 70.16 and 70.17).):*

### Description, pages:

1-9 as originally filed

### Claims, No.:

1-18 as received on 16/10/2000 with letter of 13/10/2000

### Drawings, sheets:

1/1 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

# INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI99/00910

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

*(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)*

6. Additional observations, if necessary:

## V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

### 1. Statement

Novelty (N)	Yes:	Claims	1-18
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-18
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-18
	No:	Claims	

2. Citations and explanations  
**see separate sheet**

**INTERNATIONAL PRELIMINARY  
EXAMINATION REPORT - SEPARATE SHEET**

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International application No. PCT/FI99/00910

Independent claim 1 is directed to a coated food paperboard including an inner layer comprising a polymeric blend as defined in the characterising portion of the claim.

According to the applicants' submissions in their letter dated 13 October 2000, "the invention effectively solves the problem of producing a polymeric coating that can be adhered to a paperboard while having a heat resistance high enough to allow moulding operations at elevated temperatures and to withstand the high oven temperatures the coated paperboard may be subjected to when in use".

No disclosure can be found in the documents cited in the search report of a polymeric blend as defined in claim 1, let alone a suggestion that the provision of an inner layer comprising a blend of that type should be conducive to the solution of the stated problem.

## Patent claims

1. A coated food paperboard (1), comprising one or several fibre material layers (2, 4, 5), and a heat-resistant polymeric coating (3) getting into contact with food, said coating (3) consisting of superimposed polymeric layers comprising an outer layer (6), the melting point of the polymer of which is at least 230 °C, and an inner layer (7) placed against the fibre material layer (5), to achieve adhesion between the coating and the fibre material, **characterized** in that the inner layer (7) comprises a first polymer with a melting point of at least 230 °C, blended with a second polymer which is an adhesive polymer with a melting point of 130 - 185 °C in a ratio of 85 - 97% of said first polymer and 3 - 15% of said second polymer.
2. Paperboard according to claim 1, **characterised** in that the polymer of the outer layer (6) and the one of the polymers of the inner layer (7) are of the same polymeric material.
3. Paperboard according to claim 2, **characterised** in that the outer layer (6) of the coating is polyethylene terephthalate, and the inner layer (7) is a mixture of polyethylene terephthalate and a terephthalate-based copolyester with a lower melting point.
4. Paperboard according to some of the preceding claims, **characterised** in that the total weight of the polymeric coating (3) is at most 25 g/m<sup>2</sup>, preferably 15 - 22 g/m<sup>2</sup>.
5. Paperboard according to claim 1, **characterised** in that the inner layer (7) of the coating further has blended in it fine mineral substance.
6. Paperboard according to claim 1, **characterised** in that the inner layer (7) comprises 80 - 90% of polymer with a melting point of at least 230 °C, 3 - 10% of polymer with a melting point of 130 - 185 °C, and 5 - 15% of mineral substance.
7. Paperboard according to claim 5 or 6, **characterised** in that the mineral substance is calcium carbonate.
8. Paperboard according to claim 7, **characterised** in that the outer layer (6) of the coating is polyethylene terephthalate and the inner layer (7) is a mixture of polyethylene terephthalate, a terephthalate-based copolymer with a lower melting point, and calcium carbonate.

9. Paperboard according to one of the claims 5 – 8, **characterised** in that the total weight of the coating (3) is at most  $25 \text{ g/m}^2$ , preferably  $13 - 22 \text{ g/m}^2$ .
10. Paperboard according to one of the preceding claims, **characterised** in that the fibre material layers comprise a three-layer structure (2), in which the middlemost layer is a thicker layer (4) consisting of a mixture of chemical pulp and CTMP, the thinner layers (5) on both sides of it consisting substantially of pure chemical pulp.
11. A method for manufacturing a coated paperboard (1) according to one of the preceding claims, **characterised** in that the polymer forming the outer layer (6) of the coating and the polymeric mixture forming the inner layer (7) are coextruded together onto a moving paperboard web.
12. The use of the coated paperboard (1) according to one of the claims 1 – 10 as a heat-resistant oven board..
13. The use of the paperboard according to claim 12 as part of a consumer package shaped as a dish (8) for heatable food.
14. The use of the coated paperboard (1) according to one of the claims 1 – 10 as a liquid packaging board.
15. An oven dish (8), **characterised** in that it has been manufactured of the paperboard (1) according to one of the claims 1 – 10 so that the polymeric coating of the paperboard is attached to the interior surface of the dish (8).
16. An oven dish according to claim 15, **characterised** in that it has been manufactured of paperboard (1) by compression.
17. An oven dish according to claim 15, **characterised** in that it has been manufactured of paperboard (1) by folding and joint sealing the folds thus produced to the exterior surface of the dish.
18. A heatable food package, **characterised** in that it comprises the oven dish (8) according to one of the claims 15 – 17, food intended to be heated in the dish, and a removable protective cover or wrapping closing the dish.



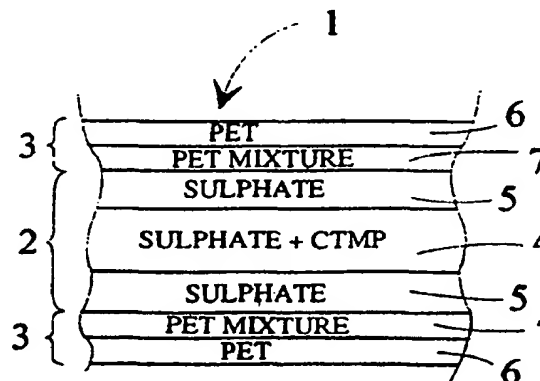
## INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

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<b>(21) International Application Number:</b> PCT/FI99/00910 <b>(22) International Filing Date:</b> 1 November 1999 (01.11.99) <b>(30) Priority Data:</b> 982372 2 November 1998 (02.11.98) FI <b>(71) Applicant (for all designated States except US):</b> STORA ENSO OYJ [FI/FI]; Kanavaranta 1, FIN-00160 Helsinki (FI). <b>(72) Inventors; and</b> <b>(75) Inventors/Applicants (for US only):</b> AHO, Yrjö [FI/FI]; Karhunpääntie 99, FIN-55300 Rauha (FI). PENTTINEN, Tapani [FI/FI]; Lökörentie 31, FIN-49210 Huutjärvi (FI). SALMINEN, Risto [FI/FI]; Rauduskatu 9, FIN-48600 Karhula (FI). FOSTER, Bruce [US/US]; 617, Ruth Lynn Drive, Longview, TX 75605 (US). <b>(74) Agent:</b> BERGGREN OY AB; P.O. Box 16, FIN-00101 Helsinki (FI).		<b>(81) Designated States:</b> AE, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CR, CU, CZ, DE, DK, DM, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SL, SZ, TZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG).  <b>Published</b> <i>With international search report.</i> <i>In English translation (filed in Finnish).</i>

**(54) Title:** COATED PAPERBOARD, PROCESS FOR MANUFACTURING THE SAME AND PRODUCTS OBTAINED THEREOF

**(57) Abstract**

The invention relates to a coated food paperboard (1), to the manufacturing process and use of the same, and to products obtained thereof. The paperboard (1) comprises one or several fibre material layers (2), such as a three-layer structure consisting of a middle layer (4) of a mixture of sulphate pulp and CTMP and of sulphate pulp layers (5) on both sides of it, and a polymeric coating (3) getting into contact with food, either on one side or on both sides of the paperboard. According to the invention, the coating (3) consists of an outer layer (6), the melting point of the polymer used in which is at least 230 °C, and of an inner layer (7) placed against the fibre material layer (5); in this inner layer, a polymer with a melting point of at least 230 °C is blended with another adhesive polymer, the melting point of which is 130–185 °C. Further, the inner layer (7) may be provided with mineral substance, such as calcium carbonate. In accordance with the invention, the paperboard (1) is manufactured by coextrusion of superimposed polymeric layers (6, 7). The paperboard (1) of the invention is suitable for liquid packaging or oven board, and products manufactured of the paperboard comprise especially oven dishes and consumer packages for food, which include the dish and which may be heated as such.



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## Coated paperboard, process for manufacturing the same and products obtained thereof

The object of the present invention is a coated paperboard for food, comprising one  
5 or more layers of fibre material and a heat-resistant polymeric coating, which gets into contact with food. Further, the invention relates to the manufacturing process and use of such a paperboard, and to a number of products obtained thereof.

A heat-resistant oven board is used as material for such food dishes and packages, which have to withstand heating in a common or microwave oven. A typical  
10 heatable food dish is an oven dish, which may be used as part of a finished package for heatable food, but which may also be marketed to consumers as a separate product. The polymeric coating of an oven board makes the paperboard water and grease resistant, and the polymer has to withstand the temperatures used in heating, typically at least 230 °C.

15 It has been known to use polypropylene or polyesters, such as polyethylene terephthalate (PET) as coating for oven boards. The problem with some of these known polymers has been insufficient heat resistance. Another problem relating to all polyesters used as coatings is the poor adhesion of the polymer to the paperboard. In order to achieve sufficient adhesion, the coating has to be spread  
20 onto the paperboard in layer thicknesses which are at least approx. 35 – 40 g/m<sup>2</sup>. If the layer is thinner, there is a danger of it coming off, for example, due to vapour released from the paperboard. The use of possible binding agents improving the adhesion has been restricted by their poor heat resistance. Pin holes are also easily left in a thin polymeric layer.

25 Polyesters as such, and especially PET with a high melting point, are very well adapted to be used as coatings for oven paperboard. These polymers are compatible with food, because of their sufficient mechanical strength and heat resistance, and because their organoleptic advantageousness is kept at oven temperatures, they are heat-sealable and they may be spread onto the paperboard by extrusion. The only  
30 problem is caused by layer thicknesses which indicate a high material consumption and high amounts of polymer contained in the waste taken to dumping areas or material recycling. The need for reduction in polymer consumption is especially emphasised as even stronger and thinner fibre bases for paperboard have been developed and as the norms concerning waste take into account also the relative

amount of polymer compared with fibre material included, besides the absolute amount.

The object of the present invention is to form a coated paperboard, in which the adhesion of the polymeric coating to the paperboard has been improved, while simultaneously making the coating thinner and less prone to hole formation as before. It is characteristic of the paperboard of the invention that it is formed of superimposed polymeric layers, comprising an outer layer in which the melting point for the polymer used is at least 230 °C, and an inner layer placed against the fibre material layer, the inner layer including polymer with a melting point of at least 230 °C blended with another polymer achieving adhesion between the coating and fibre material, the melting point of this polymer being 130 - 185 °C.

The outer layer of the two-layer polymeric coating of the paperboard of the invention contacting the food thus comprises a heat-resistant polymer with the necessary oven properties and preferably consisting of some known coating polymer for oven boards that has been tested in use. According to the invention, adhesion of the outer polymeric layer to the paperboard, i.e. to the fibre material layer below, is achieved by an inner adhesion layer in which another adhesive polymer with a lower melting point has been blended with the heat-resistant polymer. Because of the heat-resistant polymer melting at or above 230 °C, the inner layer withstands heating in a stove or microwave oven at the same time as it is modified by said polymer melting at lower temperatures so that its adhesion to the fibre material is substantially better than before. Due to improved adhesion, the two-layer polymeric coating for the paperboard of the invention may be produced with a considerably smaller amount of polymer, even when added together, than the previous one-layer coatings for oven paperboards.

Besides oven boards, the paperboard of the invention is also applicable to liquid packaging boards, e.g. drinking cups and other disposable dishes, due to its compatibility with food and its heat-sealability.

The mixture ratio of polymers in the inner coating layer of the paperboard of the invention preferably is within the range of 85 - 97% of polymer with a higher melting point ( $\geq 230$  °C) and 3 - 15% of adhesive polymer with a lower melting point (130 - 185 °C). The polymer with the higher melting point is most preferably the same polymer as has been used in the outer layer of the coating.

A preferable polymer to be used in the outer coating layer and also as the second polymeric component of the inner coating layer is polyethylene terephthalate, such as Eastapak PET copolyester with a melting point of 240 °C, manufactured by Eastman Chemical Company, or Eastapak PET polyester 12440, manufactured by the same company. In PET-based copolyesters, comonomers used in relatively small amounts (approx. 1 – 10%) may comprise, for example, cyclohexane dimethanol (CHDM) or isophthalic acid (IPA), which improve the processability of the polymer. Other polymers may comprise polybutene terephthalate, polyethylene glycol-modified polyethylene terephthalate (PETG), polyethylene naphthalene (PEN), and polypentene, which, used as such, all adhere poorly to fibre material; but the problem of adhesion related with these may be solved with a two-layer coating of the present invention.

The adhesive polymeric component melting at 130 - 185 °C for the inner coating layer may preferably comprise a terephthalate-based copolyester which especially well both blends with and binds to said polyethylene terephthalate melting at or above 230 °C. An example of such polymers is Eastobond copolyester 19411 manufactured by Eastman Chemical Company, in which the used comonomer is diethylene glycol (DEG), reducing the crystallinity of the polymer and increasing the polarity due to its OH groups, these factors improving the adhesion between the polymer and the paperboard.

The invention is further applicable in an advantageous way so that, besides the two polymeric components, the inner coating layer is provided with fine mineral substance. It has been noted that mineral substance facilitates the coextrusion of polymeric layers onto paperboard and makes it possible for the polymeric layer to be even thinner than before. An especially suitable mineral is, for example, calcium carbonate but, for example, also titanium oxide or talcum are usable. When using a mineral component, the composition of the inner coating layer may preferably vary within the range of 80 – 90% of polymeric component melting at a higher temperature ( $\geq 230$  °C), 3 – 10% of adhesive polymeric component melting at a lower temperature (130 - 185 °C), and 5 – 15% of mineral substance.

The total weight of a two-layer polymeric coating of the paperboard of the invention is preferably at most 25 g/m<sup>2</sup>, most preferably 15 – 22 g/m<sup>2</sup>. By using said mineral substance as part of the inner layer, the total weight of the coating may be in an even lower range, i.e. 13 – 22 g/m<sup>2</sup>.

The fibre base for the paperboard of the invention preferably consists of a three-layer paperboard, in which the middlemost layer is a thicker layer of a mixture of chemical pulp and CTMP, and the layers on both sides of this layer substantially consist of pure chemical pulp. The polymeric coating may be spread either on only one side or both sides of the paperboard.

It is characteristic of the method for manufacturing a coated paperboard of the invention that the polymer forming the outer layer of the coating and the polymeric mixture forming the inner layer are together coextruded onto a moving paperboard web. Extrusion is followed by rapid cooling during which the polymer remains in an amorphous state so that it is heat-sealable. Most preferable for coextrusion is a layer combination in which the outer layer to be placed onto the paperboard consists of polyethylene terephthalate, such as said PET polyester 12440 or PET copolyester 9921, the inner layer comprising a mixture of polyethylene terephthalate, such as either of the said products, of a terephthalate-based copolyester, such as the said Eastman copolyester 19411, and of calcium carbonate. However, in the applications of the process, the layers to be coextruded may vary, as is apparent of the above description of the paperboard of the invention.

Products to be manufactured of the paperboard of the invention comprise, above all, paperboard oven dishes for heating food in a common or microwave oven. For protecting the paperboard base of the dish and for preventing the food from sticking to the dish, the polymeric coating of the paperboard has to be provided at least to the interior surface of the dish. However, it is preferable to provide both the interior and exterior surface of the dish with a polymeric coating, in which case the paperboard is also protected from possible spatters and grease in the baking plate.

The oven dish of the invention may be formed of paperboard coated with polymer either by pressing or, alternatively, by folding and joint sealing the folds thus produced to the exterior surface of the dish. In either case, the polymeric coating withstands the joint sealing and other moulding measures without hole formation or breaking.

According to the invention, the oven dish may form part of a finished package for food, the package and its contents being heatable as such in a stove or microwave oven. Besides the dish and the heatable food packed into it, such a package comprises a separate protective cover or wrapping, which is removed before heating, when necessary.

As mentioned above, the paperboard of the invention is also usable in products manufactured of liquid packaging board, such as disposable cups, plates and packages. Here the advantage of polyesters, such as PET, is that they are heat-sealable and that they do not give any taste or smell to foods in contact with them.

5 With the invention, it has been possible to improve the mutual adhesion of PET and paperboard and to reduce the thickness of the PET layer.

The invention further comprises the use of the coated paperboard described above as oven board or as liquid packaging board and, especially, the use of it as part of a consumer package shaped as a dish, containing heatable food.

10

The invention is next described in more detail with the help of examples, referring first to the enclosed drawings, in which

Fig. 1 is a schematic view of a polymer-coated paperboard of the invention;

Fig. 2 is a schematic view of a second paperboard of the invention;

15 Fig. 3 shows an oven dish manufactured of paperboard of Fig. 2; and

Fig. 4 shows on enlarged scale a section of the wall structure of a dish in accordance with Fig. 3 at the edge of the dish.

In Figure 1, there is shown the layer structure of paperboard 1, the other side of which is provided with a polymeric coating. The fibre layers of the paperboard are together referred to with the reference number 2 and the polymeric coating with the reference number 3 in the figure.

20

The fibre layers 2 consist of a three-layer paperboard, the thicker middle layer 4 of which is a mixture of sulphate pulp and CTMP, the outer layers 5 on the both sides of the middle layer consisting of sulphate pulp. The share of the middle layer 4 of the weight of the fibre layers 2 is approx. 60%, and the share of both the said sulphate pulp layers 5 is approx. 20%. The total weight of the fibre layers 2 without the coating layers may be approx. 200 – 400 g/m<sup>2</sup>, for example, approx. 225 g/m<sup>2</sup>. When necessary, filler (not shown) may be used on the surfaces of the three-layer paperboard. In Figure 1, the polymeric coating 3 consists of an outer layer 6, in which a polymer compatible with food has been used, the melting point of which is at least 230 °C, and of an inner layer 7 coextruded with the outer layer, the inner layer comprising a polymer, the melting point of which is at least 230 °C, blended

25

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with another adhesive polymer with a melting point of 130 - 185 °C. Besides the said polymeric components, the inner layer 7 may contain a fine mineral substance, such as calcium carbonate. The polymeric coating 3 may consist of an outer layer 6 of, for example, polyethylene terephthalate with a melting point of 240 °C, and of  
5 an inner layer 7, which includes a mixture of 80 - 90% of the same polyethylene terephthalate as in the outer layer, 3 - 10% of adhesive terephthalate-based copolyester with a melting point of 159 °C, and 5 - 15% calcium carbonate. The added weight of the layers 6, 7 of the polymeric coating 3 then is preferably 13 - 20 g/m<sup>2</sup>.

10 The coated paperboard of Fig. 2 is structurally similar to that shown in Fig. 1, with the exception that its both sides are provided with polymeric coating 3. The fibre layers 2 are thus formed of a similar three-layer paperboard as in the application in Fig. 1, and also the materials and weight of the polymeric coatings 3 on both sides of the paperboard 1 may correspond to those shown in Fig. 1. The paperboard of  
15 both Fig. 1 and Fig. 2 is suitable to be used as material for oven dishes; in this case, the paperboard of Fig. 1 has the advantage that the amount of polymer in relation to fibre material is smaller, and the advantage of the application in Fig. 2 is that the paperboard is better protected from moisture and grease.

In Figure 3, there is shown an oven dish manufactured of the paperboard of Fig. 2,  
20 which, for example, is suitable for a package for ready-prepared foods. The dish 8 thus comprises a polymeric coating 3 both on its interior and exterior surface, as is shown in Fig. 4.

## Examples

### Example 1

25 One side of a three-layer paperboard with a weight of 295 g/m<sup>2</sup> and propagation speed of 300 m/min, was provided by coextrusion with a top layer of Eastapak PET copolyester 9921 and with an inner layer comprising a mixture of 80 weight % of Eastapak PET copolyester 9921, 10 weight % of adhesive Eastobond copolyester 19411, and 10 weight % of calcium carbonate. The extrusion temperature was  
30 290 °C and the air gap, i.e. the distance of extrusion nozzles from the paperboard web, was 18 cm. The weight of both the extruded polymeric layers was 11g/m<sup>2</sup>, i.e. the total weight of the two-layer coating thus obtained was 22 g/m<sup>2</sup>.

### Examples 2 – 4

The procedure of Example 1 was followed with the exception that the weights of the layers extruded in weight ratio 1:1 were 10 g/m<sup>2</sup>, 9 g/m<sup>2</sup> and 8 g/m<sup>2</sup>, and, respectively, the total weights of the two-layer coating were 20 g/m<sup>2</sup>, 18 g/m<sup>2</sup> and 16 g/m<sup>2</sup>.

### Example 5

A two-layer coating was coextruded on both sides of a three-layer paperboard with a weight of 295 g/m<sup>2</sup> and propagation speed of 300 m/min, the top layer of the coating comprising Eastapak PET copolyester 9921 and the inner layer being a mixture of 80 weight % of Eastapak PET copolyester 9921, 10 weight % of adhesive Eastobond copolyester 19411, and 10 weight % of calcium carbonate. The extrusion temperature was 290 °C and the air gap, i.e. the distance of extrusion nozzles from the paperboard web, was 18 cm. The weight of each of the extruded polymeric layers was 11 g/m<sup>2</sup> so that a two-layer coating with a total weight of 22 g/m<sup>2</sup> was produced on both sides of the paperboard.

### Example 6

The procedure of Example 5 was followed with the exception that the weight of each of the extruded polymeric layers was 10 g/m<sup>2</sup> so that a two-layer coating with the total weight of 20 g/m<sup>2</sup> was produced on both sides of the paperboard.

### 20 Reference material

One side of a three-layer paperboard with a weight of 295 g/m<sup>2</sup> and propagation speed of 300 m/min was extruded with Eastapak PET copolyester 9921 to produce a one-layer coating. The extrusion temperature was 290 °C and the air gap in extrusion was 18 cm. The weight of the extruded layer was 22 g/m<sup>2</sup>.

### 25 Tearing tests

The adhesion of the coating was evaluated from the coated paperboards produced in accordance with Examples 1 – 4 and the reference material by tearing off the polymeric coating from dry paperboard. The evaluation took place on a scale of 1 – 6, in which the best value 1 represented a 100% fibre tear, the surface of the polymeric coating torn off the paperboard then being totally covered by fibres, the poorest value 6 representing missing adhesion, in which case the surface of the coating torn off from the paperboard was clear, without adhered fibres. The value 6

indicates a rejected result, while the value 5 again is still sufficient to keep the coating adhered to the paperboard as the paperboard is being processed into a food dish.

- 5 Further, wet adhesion was evaluated from the same materials by soaking the paperboard samples in room-temperature water and by tearing off the polymeric coating from the completely waterlogged paperboard. The scale was 1 – 3, the values 1 and 2 representing an approved and the value 3 a rejected result.

The test results have been shown in the following Table I.

**Table I**

10	Material	Dry adhesion	Wet adhesion
	Example 1	1	1
	Example 2	1	1
	Example 3	3	2
	Example 4	4	2
15	Reference material	6	3

#### **Processing into an oven dish and heating tests**

- 20 Oven dishes were manufactured of paperboards with polymeric coatings in accordance with Examples 1 – 4 by stamping a paperboard with a moisture rate of 11% by a hydraulic compression tool, the temperature of which was 200 °C. The dishes thus obtained were then kept in an oven with a temperature of 230 °C for 30 minutes.

- 25 In stamping, the paperboard is placed into a high temperature for a short time, the moisture contained in the paperboard evaporating and generating a pressure which may remove some of the coating. Also in an oven there is the danger of gas bubbles forming beneath the coating and the coating unsticking. In the tests carried out, the paperboards in accordance with Examples 1 – 4, however, withstood the stamping and heating in an oven without any signs of the coating unsticking or of some other damages.



**Heat sealing tests**

Drinking cups were manufactured of paperboards coated on both sides with polymer according to Examples 5 and 6 by heat sealing at a sealing temperature of 250 °C. Risk factors in the joint sealing are that the joints remain leaking or that pin holes will exist in the area of joints in the coating layer, due to heating.

Sealability was evaluated by filling the cups with a test liquid containing approx. 50% of water, approx. 50% of ethanol and a small amount of colouring agent, the penetration of which into the paperboard is an easily observable sign of failed sealing. In the test, no leaks were observed in the joints of neither cup manufactured of the cardboard of the example.

It is obvious for one skilled in the art that the applications of the invention are not limited to the above examples, but they may vary within the scope of the following patent claims.

**Patent claims**

1. A coated food paperboard (1), comprising one or several fibre material layers (2, 4, 5), and a heat-resistant polymeric coating (3) getting into contact with food, **characterised** in that the coating (3) consists of superimposed polymeric layers  
5 comprising an outer layer (6), the melting point of the polymer of which is at least 230 °C, and an inner layer (7) placed against the fibre material layer (5), the inner layer comprising a polymer with a melting point of at least 230 °C blended with another polymer with a melting point of 130 - 185 °C, achieving adhesion between the coating and the fibre material.
- 10 2. Paperboard according to claim 1, **characterised** in that the inner layer (7) of the coating consists of 85 – 97% of polymer with a melting point of at least 230 °C, and 3 – 15% of polymer with a melting point of 130 - 185 °C.
3. Paperboard according to claim 1 or 2, **characterised** in that the polymer of the outer layer (6) and the one of the polymers of the inner layer (7) are of the same  
15 polymeric material.
4. Paperboard according to claim 3, **characterised** in that the outer layer (6) of the coating is polyethylene terephthalate, and the inner layer (7) is a mixture of polyethylene terephthalate and a terephthalate-based copolyester with a lower melting point.
- 20 5. Paperboard according to some of the preceding claims, **characterised** in that the total weight of the polymeric coating (3) is at most 25 g/m<sup>2</sup>, preferably 15 – 22 g/m<sup>2</sup>.
6. Paperboard according to claim 1, **characterised** in that the inner layer (7) of the coating further has blended in it fine mineral substance.
- 25 7. Paperboard according to claim 1, **characterised** in that the inner layer (7) comprises 80 – 90% of polymer with a melting point of at least 230 °C, 3 – 10% of polymer with a melting point of 130 - 185 °C, and 5 – 15% of mineral substance.
8. Paperboard according to claim 6 or 7, **characterised** in that the mineral substance is calcium carbonate.
- 30 9. Paperboard according to claim 8, **characterised** in that the outer layer (6) of the coating is polyethylene terephthalate and the inner layer (7) is a mixture of

polyethylene terephthalate, a terephthalate-based copolymer with a lower melting point, and calcium carbonate.

10. Paperboard according to one of the claims 6 – 9, **characterised** in that the total weight of the coating (3) is at most  $25 \text{ g/m}^2$ , preferably  $13 - 22 \text{ g/m}^2$ .

5 11. Paperboard according to one of the preceding claims, **characterised** in that the fibre material layers comprise a three-layer structure (2), in which the middlemost layer is a thicker layer (4) consisting of a mixture of chemical pulp and CTMP, the thinner layers (5) on both sides of it consisting substantially of pure chemical pulp.

10 12. A method for manufacturing a coated paperboard (1) according to one of the preceding claims, **characterised** in that the polymer forming the outer layer (6) of the coating and the polymeric mixture forming the inner layer (7) are coextruded together onto a moving paperboard web.

13. The use of the coated paperboard (1) according to one of the claims 1 – 11 as a heat-resistant oven board..

15 14. The use of the paperboard according to claim 13 as part of a consumer package shaped as a dish (8) for heatable food.

15. The use of the coated paperboard (1) according to one of the claims 1 – 11 as a liquid packaging board.

20 16. An oven dish (8), **characterised** in that it has been manufactured of the paperboard (1) according to one of the claims 1 – 11 so that the polymeric coating of the paperboard is attached to the interior surface of the dish (8).

17. An oven dish according to claim 16, **characterised** in that it has been manufactured of paperboard (1) by compression.

25 18. An oven dish according to claim 16, **characterised** in that it has been manufactured of paperboard (1) by folding and joint sealing the folds thus produced to the exterior surface of the dish.

19. A heatable food package, **characterised** in that it comprises the oven dish (8) according to one of the claims 16 – 18, food intended to be heated in the dish, and a removable protective cover or wrapping closing the dish.

1/1

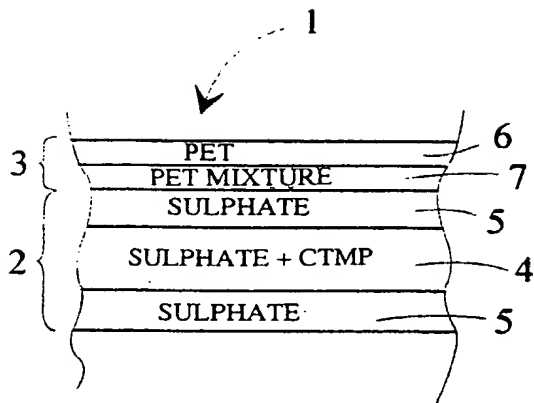


Fig 1.

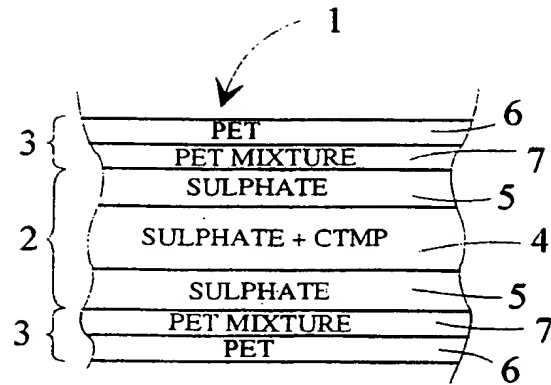


Fig 2.

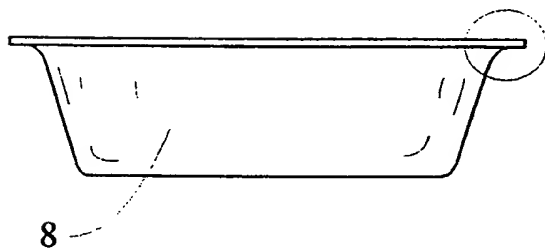


Fig 3.

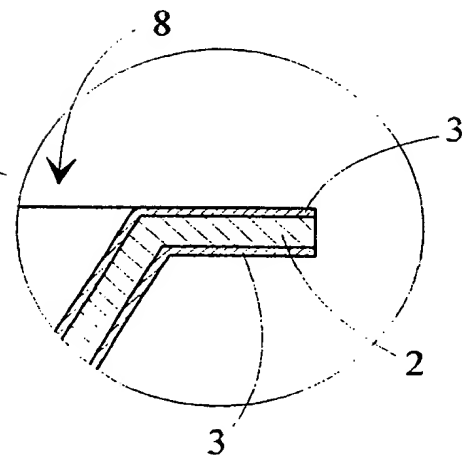


Fig 4.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00910

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B32B 27/10, B32B 27/36

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B32B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	US 4455184 A (KENNETH P. THOMPSON), 19 June 1984 (19.06.84), column 1, line 19 - line 20; column 1, line 46 - line 56; column 2, line 43 - line 61, column 3, line 1 - line 2; abstract --	1-19
Y	EP 0215630 A2 (THE PROCTER & GAMBLE COMPANY), 25 March 1987 (25.03.87), page 3, line 22 - line 31; page 4, line 18 - line 21; page 8, line 13 - line 16, abstract --	1-19
A	US 4147836 A (SCOTT W. MIDDLETON ET AL), 3 April 1979 (03.04.79), column 1, line 29 - line 36, abstract --	1-19

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

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"I" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

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"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

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"&amp;" document member of the same patent family

Date of the actual completion of the international search

4 February 2000

Date of mailing of the international search report

07-02-2000

Name and mailing address of the ISA/

Swedish Patent Office

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## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 99/00910

## C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0685332 A1 (TEIJIN LIMITED), 6 December 1995 (06.12.95), page 3, line 6 - line 22; page 5, line 55 - page 6, line 24  --	1-4,6-9,12
A	US 4041206 A (KENJI TSUNASHIMA ET AL), 9 August 1977 (09.08.77)  -- -----	1-19

# INTERNATIONAL SEARCH REPORT

Information on patent family members

02/12/99

International application No.

PCT/FI 99/00910

Patent document cited in search report			Publication date	Patent family member(s)	Publication date
US	4455184	A	19/06/84	NONE	
EP	0215630	A2	25/03/87	SE 0215630 T3 AT 66866 T AU 589209 B AU 6256686 A CA 1277295 A DE 3681238 A DK 434386 A ES 2002478 A FI 85963 B,C FI 863653 A GR 862304 A IE 58649 B JP 2583218 B JP 62128752 A PT 83292 A,B US 4753832 A	15/09/91 05/10/89 12/03/87 04/12/90 10/10/91 11/03/87 16/08/88 13/03/92 11/03/87 12/01/87 03/11/93 19/02/97 11/06/87 01/10/86 28/06/88
US	4147836	A	03/04/79	CA 1116551 A CA 1125701 A US RE32270 E	19/01/82 15/06/82 28/10/86
EP	0685332	A1	06/12/95	DE 69420130 D JP 7156356 A US 5874163 A WO 9515852 A JP 2941640 B JP 7256846 A	00/00/00 20/06/95 23/02/99 15/06/95 25/08/99 09/10/95
US	4041206	A	09/08/77	NONE	

**PCT REQUEST**

49161

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0	Form receiving Office used only	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT International Application"	
0-4	Form - PCT/RO/101 PCT Request Prepared using	PCT-EASY Version 2.84 (updated 01.07.1999)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	National Board of Patents and Registration (Finland) (RO/FI)
0-7	Applicant's or agent's file reference	49161
I	Title of invention	COATED PAPERBOARD, PROCESS FOR MANUFACTURING THE SAME AND PRODUCTS OBTAINED THEREOF
II	Applicant	
II-1	This person is:	applicant only
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III-1-7	State of residence	FI



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III-2	Applicant and/or inventor	
III-2-1	This person is:	applicant and inventor
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III-2-7	State of residence	FI
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III-3-7	State of residence	FI
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III-4-1	This person is:	applicant and inventor
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III-4-7	State of residence	US
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<b>V</b>	<b>D signat n of States</b>	
<b>V-1</b>	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	<p>AP: GH GM KE LS MW SD SL SZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT</p> <p>EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT</p> <p>EP: AT BE CH&amp;LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT</p> <p>OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT</p>
<b>V-2</b>	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	<p>AE AL AM AT AU AZ BA BB BG BR BY CA CH&amp;LI CN CR CU CZ DE DK DM EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG MK MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW</p>
<b>V-5</b>	Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
<b>V-6</b>	Exclusion(s) from precautionary designations	NONE
<b>VI-1</b>	Priority claim of earlier national application	
<b>VI-1-1</b>	Filing date	02 November 1998 (02.11.1998)
<b>VI-1-2</b>	Number	982372
<b>VI-1-3</b>	Country	FI
<b>VI-2</b>	Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1

## PCT REQUEST

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VII-1	International Searching Authority Ch s n	Swedish Patent Office (ISA/SE)	
VIII	Check list	numb r of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	9	-
VIII-3	Claims	2	-
VIII-4	Abstract	1	49161.txt
VIII-5	Drawings	1	-
VIII-7	TOTAL	17	
	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-17	Other (specified):	Copy of Official Action in 982372	-
VIII-18	Figure of the drawings which should accompany the abstract	2	
VIII-19	Language of filing of the international application	Finnish	
IX-1	Signature of applicant or agent		
IX-1-1	Name	BERGGREN OY AB	
IX-1-2	Name of signatory	Olli-Pekka Saijonmaa	
IX-1-3	Capacity	Patent Agent	

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10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
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0-1	International Application No.	PCT/FI 99 / 0 0 9 1 0
0-2	International Filing Date	0 1 NOV 1999 ( 0 1. 11. 99 )
0-3	Name of receiving Office and "PCT International Application"	The Finnish Patent Office PCT International Application
0-4	<b>Form - PCT/RO/101 PCT Request</b>	
0-4-1	Prepared using	PCT-EASY Version 2.84 (updated 01.07.1999)
0-5	<b>Petition</b> The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	<b>Receiving Office (specified by the applicant)</b>	National Board of Patents and Registration (Finland) (RO/FI)
0-7	<b>Applicant's or agent's file reference</b>	49161
I	<b>Title of invention</b>	COATED PAPERBOARD, PROCESS FOR MANUFACTURING THE SAME AND PRODUCTS OBTAINED THEREOF
II	<b>Applicant</b>	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
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III-1-7	State of residence	FI

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III-2-1	This person is:	applicant and inventor
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III-2-7	State of residence	FI
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III-3-1	This person is:	applicant and inventor
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III-3-6	State of nationality	FI
III-3-7	State of residence	FI
III-4	<b>Applicant and/or inventor</b>	
III-4-1	This person is:	applicant and inventor
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III-4-6	State of nationality	US
III-4-7	State of residence	US
IV-1	<b>Agent or common representative; or address for correspondence</b>	
	The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name	BERGGREN OY AB
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IV-1-4	Facsimile No.	+358-9-6933944
IV-1-5	e-mail	email.box@berggren.elisa.fi

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49161

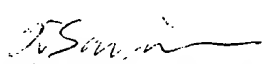
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<b>V</b>	<b>Designation of States</b>	
<b>V-1</b>	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	<p><b>AP:</b> GH GM KE LS MW SD SL SZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT</p> <p><b>EA:</b> AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT</p> <p><b>EP:</b> AT BE CH&amp;LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT</p> <p><b>OA:</b> BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT</p>
<b>V-2</b>	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	<p><b>AE AL AM AT AU AZ BA BB BG BR BY CA CH&amp;LI CN CR CU CZ DE DK DM EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MD MG MN MW MX NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW</b></p>
<b>V-5</b>	<b>Precautionary Designation Statement</b> In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
<b>V-6</b>	<b>Exclusion(s) from precautionary designations</b>	<b>NONE</b>
<b>VI-1</b>	<b>Priority claim of earlier national application</b>	
<b>VI-1-1</b>	Filing date	<b>02 November 1998 (02.11.1998)</b>
<b>VI-1-2</b>	Number	<b>982372</b>
<b>VI-1-3</b>	Country	<b>FI</b>
<b>VI-2</b>	<b>Priority document request</b> The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	<b>VI-1</b>

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VII-1	International Searching Authority Chosen	Swedish Patent Office (ISA/SE)	
VIII	Check list	number of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	9	-
VIII-3	Claims	2	-
VIII-4	Abstract	1	49161.txt
VIII-5	Drawings	1	-
VIII-7	TOTAL	17	
	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-17	Other (specified):	Copy of Official Action in 982372	-
VIII-18	Figure of the drawings which should accompany the abstract	2	
VIII-19	Language of filing of the international application	Finnish	
IX-1	Signature of applicant or agent		
IX-1-1	Name	BERGGREN OY AB	
IX-1-2	Name of signatory	Olli-Pekka Saijonmaa	
IX-1-3	Capacity	Patent Agent	

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10-1	Date of actual receipt of the purported international application	01 NOV 1999	( 01 -11- 1999 )
10-2	Drawings:		
10-2-1	Received		
10-2-2	Not received		
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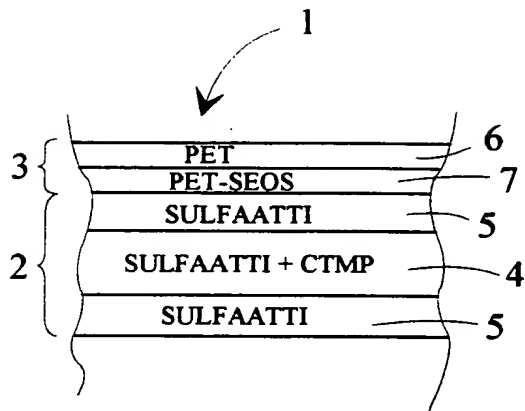


Fig 1.

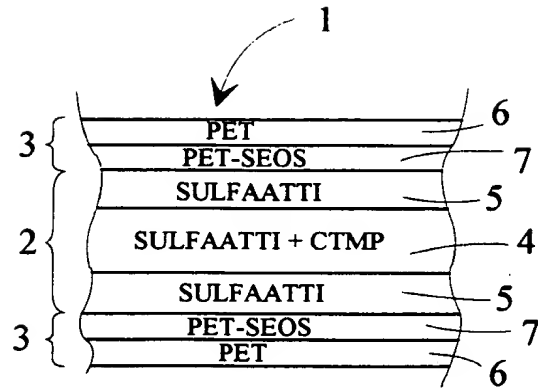


Fig 2.

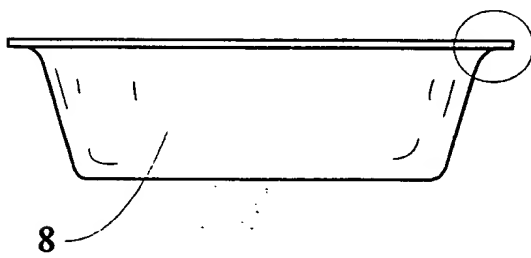


Fig 3.

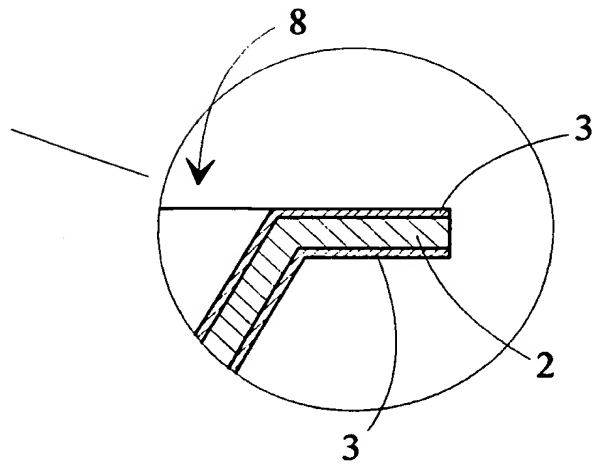


Fig 4.



## **Päällystetty kartonki, menetelmä sen valmistamiseksi sekä siitä saatuja tuotteita**

5 Tämän keksinnön kohteena on päällystetty elintarvikekartonki, joka käsittää yhden tai useampia kuitumateriaalikerroksia sekä elintarvikkeen kanssa kosketukseen tulevan kuumennusta kestävästä polymeerisen pinnoitteen. Lisäksi keksintö kohdistuu tällaisen kartongin valmistusmenetelmään, kartongin käyttöön sekä joukkoon kartongista saatuja tuotteita.

10 Kuumennusta kestävää uunikartonkia käytetään sellaisten elintarvikeastioiden ja -pakkausten materiaalina, joiden tulee kestää kuumennus tavallisissa liesiuunissa tai mikroaaltouunissa. Tyypillinen kuumennettava elintarvikeastia on uunivuoka, jota voidaan käyttää osana kuumennettavan elintarvikkeen valmispakkausta, mutta jota markkinoidaan kuluttajille myös erillisenä tuotteena. Uunikartongin polymeeripinnoitteella kartongista saadaan veden- ja rasvanpitävä, ja polymeerin tulee kestää 15 kuumennuksessa käytetyt lämpötilat, tyypillisesti vähintään 230 °C.

Uunikartonkien pinnoitteena on ollut tunnettua käyttää polypropeenitai polyestereitä, kuten esim. polyetyleenitereftalaattia (PET). Joillakin näistä tunnetuista polymeereistä on ollut ongelmana riittämätön kuumuuden kesto. Toinen ongelma, joka koskee kaikkia pinnoitteena käytettyjä polyestereitä, on polymeerin huono tarttuvuus 20 kartonkiin. Riittävän adheesion aikaansaamiseksi pinnoitetta on levitettävä kartongille kerrospaksuuksina, jotka ovat vähintään n. 35-40 g/m<sup>2</sup>. Jos kerros on ohuempi, on vaarana sen irtoaminen uunissa mm. kartongista vapautuvan vesihöyryn vaikutuksesta. Mahdollisten adheesiota parantavien sideaineiden käytön rajoituksena on ollut niiden huono kuumuuden kesto. Ohueen polymeerikerrokseen jää myös hel- 25 posti pieniä reikiä (pin holes).

Sinänsä polyesterit ja varsinkin PET, jonka sulamispiste on korkea, soveltuvat hyvin uunikartongin pinnoitteeksi. Nämä polymeerit ovat elintarvikekelpoisia, niillä on riittävä mekaaninen lujuus ja lämmönkesto, niiden organoleptinen edullisuus säilyy uunilämpötiloissa, ne ovat kuumasaumautuvia ja ne ovat levitettävissä kartongille 30 suulakepuristamalla. Ongelmana ovat vain mainitut kerrospaksuudet, jotka merkitsevät suurta materiaalin kulutusta sekä suuria polymeerimääriä kaatopaikalle tai materiaalin kierrätykseen joutuvassa jätteessä. Polymeerin kulutuksen vähentämistarve korostuu erityisesti, kun on kehitetty entistä lujempia ja ohuempia kartongin kuitupohjia ja kun jätettä koskevissa normeissa kiinnitetään huomiota paitsi poly-

merin absoluuttiseen määrään myös sen suhteelliseen määrään mukana olevaan kuitumateriaaliin verrattuna.

5 Tämän keksinnön tarkoituksena on muodostaa päällystetty kartonki, jossa polymeeripinnoitteen adheesiota kartonkiin on parannettu samalla kun pinnoitteesta on saatu entistä ohuempi ja vähemmän herkkä reikiintymiselle. Tunnusomaista keksinnön mukaiselle kartongille on se, että pinnoite muodostuu päällekkäisistä polymeerikerroksista sisältäen ulomman kerroksen, johon käytetyn polymeerin sulamispiste on vähintään 230 °C, sekä kuitumateriaalikerrosta vasten olevan sisemmän kerroksen, jossa on polymeeriä, jonka sulamispiste on vähintään 230 °C, seostettuna toiseen, 10 pinnoitteen ja kuitumateriaalin välisen adheesion aikaansaavaan polymeeriin, jonka sulamispiste on välillä 130-185 °C.

Keksinnön mukaisen kartongin kaksikerroksisen polymeeripinnoitteen ulompi, elintarviketta koskettava kerros muodostuu täten kuumuutta kestävästä polymeeristä, jolla on vaadittavat uuniominaisuudet ja joka on edullisesti jotain tunnettua ja 15 käytössä testattua uunikartonkien pinnoitepolymeeria. Keksinnön mukaan tämän ulomman polymeerikerroksen adheesio kartonkiin, so. alla olevaan kuitumateriaalikerrokseen, on aikaansaatu sisemmällä adheesiokerroksella, jossa kuumuutta kestävään polymeeriin on sekoitettu toista, alemman sulamispisteen omaavaa adhesiivista polymeeria. Kuumuutta kestävä, 230 °C:ssa tai sen yläpuolella sulavan polymeerin ansiosta sisempi kerros sietää liesi- tai mikroaaltouunissa tapahtuvan kuumennuksen samalla kun se on mainitun alemmassa lämpötilassa sulavan polymeerin avulla modifioitu siten, että sillä on oleellisesti entistä parempi tarttuvuus kuitumateriaaliin. Parantuneen adheesion ansiosta keksinnön mukaisen kartongin kaksikerroksisessa polymeeripinnoitteessa tullaan yhteenlaskienkin toimeen huomattavasti pienemmäl- 20 lä polymeerimäärällä kuin aikaisemmissa uunikartonkien yksikerroksisissa pinnoitteissa.

Paitsi uunikartongiksi, soveltuu keksinnön mukainen kartonki polymeeripinnoitteen elintarvikekelpoisuuden ja kuumasaumattavuuden ansiosta myös nestepakkauskartongiksi esim. juomamukeihin ym. kertakäyttöastioihin.

30 Polymeerien seossuhde keksinnön mukaisen kartongin sisemmässä pinnoitekerroksessa on edullisesti vaihtelurajoissa 85-97 % korkeamman sulamispisteen ( $\geq 230$  °C) omaavaa polymeeria ja 3-15 % adhesiivista, matalamman sulamispisteen (130-185 °C) omaavaa polymeeria. Korkeamman sulamispisteen omaava polymeeri on erityisen edullisesti samaa polymeeria kuin se, jota on käytetty pinnoitteen ulom- 35 massa kerroksessa.

Edullinen polymeeri käytettäväksi ulommassa pinnoitekerroksessa samoin kuin sisemmän pinnoitekerroksen toisena polymeerikomponenttina on polyetyleenitereftalaatti, kuten esim. Eastman Chemical Companyn valmistama Eastapak PET -kopolyesteri 9921, jonka sulamispiste on 240 °C tai saman yhtiön valmistama Eastapak PET - polyesteri 12440. PET-perustaisissa kopolyestereissä pienehköinä (n. 1-10 %) määrinä käytettyinä komonomeereinä voivat olla mm. sykloheksaanidimetanoli (CHDM) tai isoftaalihappo (IPA), jotka parantavat polymeerin prosessoitavuutta. Muina polymeereina voidaan mainita polybuteenitereftalaatti, polyetyleeniglykoli-modifioitu polyetyleenitereftalaatti (PETG), polyetyleeninaftaleeni (PEN) sekä polypenteeni, jotka kaikki sellaisinaan käytettyinä kiinnittyvät huonosti kuitumateriaaliin, mutta joiden adheesio-ongelma pinnoituksessa on ratkaistavissa keksinnön mukaisella kaksikerrospinnoitteella.

Sisemmän pinnoitekerroksen välillä 130-185 °C sulavan adhesiivisen polymeerikomponentin voi edullisesti muodostaa jokin tereftalaattipohjainen kopolyesteri, joka sekä sekoittuu että sitoutuu erityisen hyvin mainittuun 230 °C tai sen yläpuolella sulavaan polyetyleenitereftalaattiin. Esimerkkinä tällaisista polymeereista on Eastman Chemical Companyn valmistama Eastobond-kopolyesteri 19411, jossa komonomeerinä on käytetty dietyleeniglykolia (DEG), joka alentaa polymeerin kiteisyyttä ja lisää sen OH-ryhmistä johtuvaa polaarisuutta, jotka tekijät parantavat polymeerin ja kartongin välistä adheesiota.

Keksintö on sovellettavissa edelleen edullisesti siten, että kartongin sisempään pinnoitekerrokseen sisällytetään mainittujen kahden polymeerikomponentin lisäksi hienojakoista mineraalista ainetta. On havaittu, että mineraalinen aine helpottaa polymeeristen kerrosten koekstruusiota kartongille ja mahdollistaa sen, että polymeeripinnoitteesta saadaan vieläkin ohuempi. Mineraaliksi soveltuu erityisesti kalsiumkarbonaatti, mutta myös esim. titaanidioksidi tai talkki ovat käyttökelpoisia. Mineraalista komponenttia käytettäessä sisemmän pinnoitekerroksen koostumus voi edullisesti vaihdella rajoissa 80-90 % korkeammassa lämpötilassa ( $\geq 230$  °C) sulavaa polymeerikomponenttia, 3-10 % alemmassa lämpötilassa (130-185 °C) sulavaa adhesiivista polymeerikomponenttia ja 5-15 % mineraalista ainetta.

Keksinnön mukaisen kartongin kaksikerroksisen polymeeripinnoitteen kokonaispaino on edullisesti enintään 25 g/m<sup>2</sup>, vaihdellen edullisimmin välillä 15-22 g/m<sup>2</sup>. Käyttämällä mainittua mineraalista ainetta osana sisempää kerrosta voidaan pinnoitteen kokonaispaino saada vielä alemmalle vaihteluvälille 13-22 g/m<sup>2</sup>.

Keksinnön mukaisen kartongin kuituperustan muodostaa edullisesti kolmikerroskartonki, jossa keskimmäisenä on paksumpi kerros kemiallisen massan ja CTMP:n seosta ja sen molemmiin puolin on kerrokset oleellisesti puhdasta kemiallista massaa. Polymeeripinnoite voi olla levitettynä joko ainoastaan kartongin toiselle puolelle tai sen kummallekin puolelle.

Keksinnön mukaiselle menetelmälle edellä kuvatun päällystetyn kartongin valmistamiseksi on tunnusomaista se, että pinnoitteen ulomman kerroksen muodostava polymeeri ja sisemmän kerroksen muodostava polymeeriseos koekstrudoidaan yhdessä liikkuvalla kartonkiradalle. Ekstruusiota seuraa nopea jäähdytys, jossa polymeeri jää amorfiseen muotoon, jossa se on kuumasaumauskelpoista. Koekstrudoinnin kannalta erityisen edullinen on kerroskombinaatio, jossa kartongille tuleva ulompi kerros on polyetyleenitereftalaattia, kuten esim. edellä mainittua PET-polyesteriä 12440 tai PET-kopolyesteriä 9921, ja sisempi kerros on polyetyleenitereftalaatin, kuten jommankumman edellä mainitun tuotteen, alemman sulamispisteen omaavan tereftalaattipohjaisen kopolyesterin, kuten edellä mainitun Eastobond kopolyesterin 19411, ja kalsiumkarbonaatin seosta. Menetelmän sovellutukset voivat kuitenkin vaihdella koekstrudoitavien kerrosten suhteen siten kuin edellä olevasta keksinnön mukaisen kartongin kuvauksesta käy selville.

Keksinnön mukaisesta kartongista valmistettavia tuotteita ovat ennen muuta kartonkiset uunivuoat, jotka on tarkoitettu tavallisessa liesiuunissa tai mikroaaltouunissa tapahtuvaan ruoan kuumennukseen. Vuoan kartonkiperustan suojaamiseksi ja ruoan kiinnitarttumisen estämiseksi kartongin polymeeripinnoitteen tulee olla ainakin vuoan sisäpinnassa. Kuitenkin vuoka on edullista varustaa polymeeripinnoitteella sekä sisä- että ulkopinnaltaan, jolloin kartonki on suojattuna myös mahdollisilta roiskeilta ja paistopelliltä olevalta rasvalta.

Keksinnön mukainen uunivuoka voidaan muodostaa polymeeripinnoitteisesta kartongista puristamalla tai vaihtoehtoisesti taittamalla ja saumaamalla taitossa syntyneet laskokset kiinni vuoan ulkopintaan. Kummassakin tapauksessa polymeerinen pinnoite kestää saumauksen ja muut muovaustoimenpiteet reikiintymättä ja murtumatta.

Keksinnön mukaan uunivuoka voi muodostaa osan elintarvikkeen valmispakkauksesta, joka on sisältöineen sellaisenaan kuumennettavissa liesi- tai mikroaaltouunissa. Tällainen pakkaus käsittää vuoan ja siihen pakatun kuumennettavan elintarvikkeen ohella erillisen suojakannen tai kääreen, joka tarvittaessa poistetaan ennen kuumennusta.

- Kuten edellä mainittiin, on keksinnön mukainen kartonki käyttökelpoista myös nestepakkauskartongista valmistettaviin tuotteisiin, kuten kertakäyttömukeihin, lautaisiin ja pakkauksiin. Polyesterien, kuten PET:n etuna näissä on niiden kuumasaumautuvuus sekä se, etteivät ne anna makua tai hajua niihin kosketuksessa olevaan elintarvikkeeseen. 5 Keksinnöllä on saatu parannetuksi PET:n ja kartongin keskinäistä adheesiota ja pienennetyksi PET-kerroksen paksuutta.

Keksintö käsittää vielä edellä kuvatun pinnoitetun kartongin käytön uunikartonkina tai nestepakkauskartonkina ja erityisesti käytön vuoaksi muovattuna osana kuumentavan elintarvikkeen kuluttajapakkausta.

- 10 Keksintöä selostetaan seuraavassa yksityiskohtaisemmin esimerkkien avulla viittaamalla ensin oheiseen piirustukseen, jossa

kuvio 1 esittää skemaattisesti erästä keksinnön mukaista polymeeripinnoitettua kartonkia,

kuvio 2 esittää skemaattisesti erästä toista keksinnön mukaista kartonkia,

- 15 kuvio 3 esittää kuvion 2 mukaisesta kartongista valmistettua uunivuokaa, ja

kuvio 4 on suuremmassa mittakaavassa leikkaus kuvion 3 mukaisen vuoan seinärakenteesta vuoan reunan kohdalta.

- Kuviossa 1 nähdään keksinnön mukaisen, toiselta puoleltaan polymeerisellä pinnoitteella varustetun kartongin 1 kerrosrakenne. Kartongin kuitukerrokset on kuviossa 20 merkitty yhteisesti viitenumerolla 2 ja polymeeripinnoite viitenumerolla 3.

- Kuitukerrokset 2 muodostuvat kolmikerroskartongista, jonka paksumpi keskikerros 4 on sulfaattimassan ja CTMP:n seosta ja keskikerroksen molemmiin puolin olevat ulommat kerrokset 5 ovat sulfaattimassaa. Keskikerroksen 4 osuus kuitukerrosten 2 painosta on n. 60 % ja kummankin mainitun sulfaattimassakerroksen 5 osuus n. 25 20 %. Kuitukerrosten 2 kokonaispaino ilman pinnoitekerroksia voi olla välillä n. 200-400 g/m<sup>2</sup>, esim. n. 225 g/m<sup>2</sup>. Kolmikerroskartongin pinnoissa voidaan tarvittaessa käyttää pohjustusainetta (ei-esitetty). Polymeeripinnoite 3 muodostuu kuviossa 1 ulommasta kerroksesta 6, johon on käytetty elintarvikekelpoista polymeeriä, jonka sulamispiste on vähintään 230 °C, ja ulomman kerroksen kanssa koekstrudoidusta sisemmästä kerroksesta 7, jossa on polymeeriä, jonka sulamispiste on vähintään 30 230 °C, seostettuna toiseen adhesiiviseen polymeeriin, jonka sulamispiste on välillä 130-185 °C. Mainittujen polymeerikomponenttien ohella sisemmässä kerroksessa 7

5 voi olla hienojakoista mineraalista ainetta, kuten kalsiumkarbonaattia. Polymeeripinnoite 3 voi koostua esim. polyetyleenitereftalaattia, sp. 240 °C, olevasta ulommasta kerroksesta 6 sekä sisemmästä kerroksesta 7, jossa on sekoitettu 80-90 % samaa polyetyleenitereftalaattia kuin ulommassa kerroksessa, 3-10 % adhesiivista tereftalaattipohjaista kopolyesteria, sp. 159 °C, ja 5-15 % kalsiumkarbonaattia. Polymeeripinnoitteen 3 kerrosten 6, 7 yhteenlaskettu paino on tällöin edullisesti välillä 13-20 g/m<sup>2</sup>.

10 Kuvion 2 mukainen päällystetty kartonki 1 vastaa rakenteellisesti kuviossa 1 esitettyä, paitsi, että se on molemmin puolin varustettu polymeerisellä pinnoitteella 3. Kuitukerrokset 2 muodostuvat täten samanlaisesta kolmikerroskartongista kuin kuvion 1 sovellutuksessa, ja myös polymeeripinnoitteet 3 kartongin 1 kummallakin puolella voivat materiaaliensa ja painosta suhteen vastata kuvion 1 yhteydessä esitettyä. Sekä kuvion 1 että kuvion 2 mukainen kartonki soveltuu uunivuokien materiaaliksi, jolloin kuvion 1 kartongin etuna on pienempi polymeerin määrä kuitumateriaaliin verrattuna ja kuvion 2 kartongin etuna puolestaan kartongin parempi suojaus 15 kosteudelta ja rasvalta.

Kuviossa 3 on esitetty kuvion 2 mukaisesta kartongista valmistettu, esim. einespakkaukseksi soveltuva uunivuoka 8. Vuoka 8 käsittää täten polymeeripinnoitteen 3 sekä sisä- että ulkopinnassaan kuvion 4 mukaisesti.

## 20 Esimerkit

### Esimerkki 1

25 Kolmikerroskartongin, jonka paino oli 295 g/m<sup>2</sup> ja etenemisnopeus 300 m/min, toiselle puolelle koekstrudoitiin päälikerrokseksi Eastapak PET -kopolyesteriä 9921 ja sisemmäksi kerrokseksi seosta, jossa oli 80 paino-% Eastapak PET -kopolyesteriä 9921, 10 paino-% adhesiivista Eastobond-kopolyesteriä 19411 ja 10 paino-% kalsiumkarbonaattia. Ekstruusiolämpötila oli 290°C ja ilmaväli, eli ekstruusiosuuttimien etäisyys kartonkiradasta, oli 18 cm. Kummankin ekstrudoidun polymeerikerroksen paino oli 11 g/m<sup>2</sup>, eli saadun kaksikerrospinnoitteen kokonaispaino oli 22 g/m<sup>2</sup>.

30

### Esimerkit 2-4

35 Meneteltiin esimerkin 1 mukaisesti, paitsi että painosuhteessa 1:1 ekstrudoitujen kerrosten painot olivat 10 g/m<sup>2</sup>, 9 g/m<sup>2</sup> ja 8 g/m<sup>2</sup>, jolloin kaksikerrospinnoitteen kokonaispainot olivat vastaavasti 20 g/m<sup>2</sup>, 18 g/m<sup>2</sup> ja 16 g/m<sup>2</sup>.

**Esimerkki 5**

- Kolmikerroskartongin, jonka paino oli  $295 \text{ g/m}^2$  ja etenemisnopeus  $300 \text{ m/min}$ , kummallekin puolelle koekstrudoitiin kaksikerrospinnoite, jonka päälikerros oli
- 5 Eastapak PET -kopolyesteriä 9921 ja sisempi kerros oli seosta, jossa oli 80 paino-% Eastapak PET -kopolyesteriä 9921, 10 paino-% adhesiivista Eastobond kopolyesteriä 19411 ja 10 paino-% kalsiumkarbonaattia. Ekstruusiolämpötila oli  $290^\circ\text{C}$  ja il-
- 10 maväli, eli ekstruusiosuuttimien etäisyys kartonkiradasta, oli  $18 \text{ cm}$ . Kunkin ekstrudoidun polymeerikerroksen paino oli  $11 \text{ g/m}^2$ , jolloin kartongin kummallekin puolel-
- le saatiin kaksikerrospinnoite, jonka kokonaispaino oli  $22 \text{ g/m}^2$ .

**Esimerkki 6**

- Meneteltiin kuten esimerkissä 5, paitsi että kunkin ekstrudoidun polymeerikerroksen
- 15 paino oli  $10 \text{ g/m}^2$ , jolloin kartongin kummallekin puolelle saatiin kaksikerrospinnoite, jonka kokonaispaino oli  $20 \text{ g/m}^2$ .

**Vertailumateriaali**

- 20 Kolmikerroskartongin, jonka paino oli  $295 \text{ g/m}^2$  ja etenemisnopeus  $300 \text{ m/min}$ , toiselle puolelle ekstrudoitiin Eastapak PET -kopolyesteriä 9921 yksikerroksiseksi pinnoitteeksi. Ekstruusiolämpötila oli  $290^\circ\text{C}$  ja ilmapöytä ekstruusiossa oli  $18 \text{ cm}$ . Ekstrudoidun kerroksen paino oli  $22 \text{ g/m}^2$ .

**25 Repäisykokeet**

- Esimerkkien 1-4 mukaisesti saaduista pinnoitetuista kartongeista ja vertailumateriaalista arvioitiin pinnoitteen adheesio repäisemällä polymeeripinnoite irti kuivasta kartongista. Arviointi tapahtui arvosteluasteikolla 1-6, jossa paras arvo 1 edusti 100-
- 30 prosenttista kuiturepeämää, jolloin kartongista irtirevityn polymeeripinnoitteen pinta oli täysin kuitujen peittämä, ja heikoin arvo 6 puuttuvaa adheesiota, jolloin kartongista irronneen pinnoitteen pinta oli kirkas, vailla tarttuneita kuituja. Arvo 6 merkitsee hylättyä tulosta, kun taas arvolla 5 adheesio vielä riittää pitämään pinnoitteen kiinni kartongissa kun kartonki työstetään elintarvikeastiaksi.

- 35 Samoista materiaaleista arvioitiin lisäksi märkäadheesio liottamalla kartonkinäytteitä huoneenlämpötilaisessa vedessä ja repäisemällä polymeeripinnoite irti täysin vet-

tyneestä kartongista. Arvosteluasteikko oli 1-3, jossa arvot 1 ja 2 edustavat hyväksyttyä ja arvo 3 hylättyä tulosta.

Kokeiden tulokset on esitetty seuraavassa taulukossa I.

5

### Taulukko I

	Materiaali	Kuiva-adheesio	Märkäadheesio
10	Esimerkki 1	1	1
	Esimerkki 2	1	1
	Esimerkki 3	3	2
	Esimerkki 4	4	2
	Vertailumateriaali	6	3

15

### Työstö uunivuoaksi ja kuumennuskokeet

Esimerkkien 1-4 mukaisista polymeeripinnoitetuista kartongeista valmistettiin uunivuoat stanssaamalla kartonkia, jossa oli kosteutta 11 %, hydraulisella puristustyökälulla, jonka lämpötila oli 200 °C. Saatuja vuokia pidettiin sen jälkeen 30 min uunissa, jonka lämpötila oli 230 °C.

20

Stanssauksessa kartonki joutuu lyhytaikaisesti korkeaan lämpötilaan, jossa kartongin sisältämä kosteus höyrystyy ja aiheuttaa paineen, joka saattaa irrottaa pinnoitetta. Myös uunissa on vaarana kaasukuplien muodostuminen pinnoitteen alle ja pinnoitteen irtoaminen. Suoritetuissa kokeissa esimerkkien 1-4 mukaiset kartongit kuitenkin kestivät stanssauksen ja uunikuumennuksen ilman merkkejä pinnoitteen irtoamisesta tai muista vaurioista.

25

### 30 Kuumasaumaukset

Esimerkkien 5 ja 6 mukaisista molemmiin puolin polymeeripinnoitetuista kartongeista valmistettiin juomamukeja kuumasaumaamalla saumauslämpötilassa 250 °C. Saumauksen vaaratekijöinä ovat sauman jääminen vuotavaksi tai kuumennuksesta johtuvat pienet reiät (pin holes) pinnoitekerroksessa saumojen alueella.

35

Saumautumista arvioitiin täyttämällä muki testiliuksella, jossa oli n. 50 % vettä, n. 50 % etanolia ja pieni määrä väriainetta, jonka tunkeutuminen kartonkiin on helposti



havaittava merkki saumauksen epäonnistumisesta. Kokeessa kummankaan esimerkin mukaisesta kartongista valmistetussa mukissa ei havaittu vuotoja saumakohdissa.

- 5 Alan ammattimiehelle on selvää, että keksinnön sovellutukset eivät rajoitu edellä esimerkkeinä esitettyyn vaan voivat vaihdella seuraavien patenttivaatimukset puitteissa.

**Patenttivaatimukset**

1. Päälystetty elintarvikekartonki (1), joka käsittää yhden tai useampia kuitumateriaalikerroksia (2, 4, 5) sekä elintarvikkeen kanssa kosketukseen tulevan kuumentusta kestävä polymeerisen pinnoitteen (3), **tunnettu** siitä, että pinnoite (3) muodostuu päällekkäisistä polymeerikerroksista sisältäen ulomman kerroksen (6), johon käytetyn polymeerin sulamispiste on vähintään 230 °C, sekä kuitumateriaalikerrosta (5) vasten olevan sisemmän kerroksen (7), jossa on polymeeriä, jonka sulamispiste on vähintään 230 °C, seostettuna toiseen, pinnoitteen ja kuitumateriaalin välisen adheesion aikaansaavaan polymeeriin, jonka sulamispiste on välillä 130-185 °C.
- 10 2. Patenttivaatimuksen 1 mukainen kartonki, **tunnettu** siitä, että pinnoitteen sisemmässä kerroksessa (7) on 85-97 % polymeeriä, jonka sulamispiste on vähintään 230 °C, ja 3-15 % polymeeriä, jonka sulamispiste on välillä 130-185 °C.
3. Patenttivaatimuksen 1 tai 2 mukainen kartonki, **tunnettu** siitä, että pinnoitteessa ulomman kerroksen (6) polymeeri ja toinen sisemmän kerroksen (7) polymeereistä ovat samaa polymeerimateriaalia.
- 15 4. Patenttivaatimuksen 3 mukainen kartonki, **tunnettu** siitä, että pinnoitteen ulompi kerros (6) on polyetyleenitereftalaattia ja sisempi kerros (7) on polyetyleenitereftalaatin ja alemman sulamispisteen omaavan tereftalaattipohjaisen kopolyesterin seosta.
- 20 5. Jonkin edellisen patenttivaatimuksen mukainen kartonki, **tunnettu** siitä, että polymeerisen pinnoitteen (3) kokonaispaino on enintään 25 g/m<sup>2</sup>, sopivasti välillä 15-22 g/m<sup>2</sup>.
6. Patenttivaatimuksen 1 mukainen kartonki, **tunnettu** siitä, että pinnoitteen sisemmässä kerroksessa (7) on seostettuna lisäksi hienojakoista mineraalista ainetta.
- 25 7. Patenttivaatimuksen 6 mukainen kartonki, **tunnettu** siitä, että sisemmässä kerroksessa (7) on 80-90 % polymeeriä, jonka sulamispiste on vähintään 230 °C, 3-10 % polymeeriä, jonka sulamispiste on välillä 130-185 °C, ja 5-15 % mineraalista ainetta.
8. Patenttivaatimuksen 6 tai 7 mukainen kartonki, **tunnettu** siitä, että mineraalinen aine on kalsiumkarbonaatti.
- 30 9. Patenttivaatimuksen 8 mukainen kartonki, **tunnettu** siitä, että pinnoitteen ulompi kerros (6) on polyetyleenitereftalaattia ja sisempi kerros (7) on polyetyleenit-

tereftalaatin, alemman sulamispisteen omaavan tereftalaattipohjaisen kopolyesterin ja kalsiumkarbonaatin seosta.

10. Jonkin patenttivaatimuksen 6-9 mukainen kartonki, **tunnettu** siitä, että pinnoitteen (3) kokonaispaino on enintään  $25 \text{ g/m}^2$ , sopivasti välillä  $13\text{-}22 \text{ g/m}^2$ .

5 11. Jonkin edellisen patenttivaatimuksen mukainen kartonki, **tunnettu** siitä, että kuitumateriaalikerrokset käsittävät kolmikerrosrakenteen (2), jossa keskimmäisenä on paksumpi kerros (4) kemiallisen massan ja CTMP:n seosta ja sen molemmiin puolin ohuimmat kerrokset (5) oleellisesti puhdasta kemiallista massaa.

10 12. Menetelmä jonkin edellisen patenttivaatimuksen mukaisen päällystetyn kartongin (1) valmistamiseksi, **tunnettu** siitä, että pinnoitteen ulomman kerroksen (6) muodostava polymeeri ja sisemmän kerroksen (7) muodostava polymeeriseos koekstrudoidaan yhdessä liikkuvalla kartonkiradalle.

13. Jonkin patenttivaatimuksen 1-11 mukaisen päällystetyn kartongin (1) käyttö kuumennusta kestäväenä uunikartonkina.

15 14. Patenttivaatimuksen 13 mukainen kartongin käyttö vuoaksi (8) muovattuna osana kuumennettavan elintarvikkeen kuluttajapakkausta.

15. Jonkin patenttivaatimuksen 1-11 mukaisen päällystetyn kartongin (1) käyttö nestepakkauskartonkina.

20 16. Uunivuoka (8), **tunnettu** siitä, että se on muodostettu jonkin patenttivaatimuksen 1-11 mukaisesta päällystetystä kartongista (1) siten, että kartongin polymeerinen pinnoite sijaitsee vuoan (8) sisäpinnassa.

17. Patenttivaatimuksen 16 mukainen uunivuoka, **tunnettu** siitä, että se on muovattu kartongista (1) puristamalla.

25 18. Patenttivaatimuksen 16 mukainen uunivuoka, **tunnettu** siitä, että se on muovattu kartongista (1) taittamalla ja saumaamalla taitossa syntyneet laskokset kiinni vuoan ulkopintaan.

19. Kuumennettava elintarvikepakkaus, **tunnettu** siitä, että se käsittää jonkin patenttivaatimuksen 16-18 mukaisen uunivuoan (8), vuoassa olevan kuumennettavaksi tarkoitetun ruoan sekä vuoan sulkevan poistettavan suojakannen tai -kääreen.

**(57) Tiivistelmä**

Keksintö kohdistuu päällystettyyn elintarvikekartonkiin (1), sen valmistusmenetelmään, käyttöön sekä siitä saatuihin tuotteisiin. Kartonki (1) käsittää yhden tai useampia kuitumateriaalikerroksia (2), kuten esim. kolmikerrosrakenteen, joka muodostuu sulfaattimassan ja CTMP:n seosta olevasta keskikerroksesta (4) ja sen molemmiin puolin olevista sulfaattimassakerroksista (5), sekä elintarvikkeen kanssa kosketukseen tulevan polymeerisen pinnoitteen (3), joko kartongin toisella puolella tai sen molemmilla puolilla. Keksinnön mukaan pinnoite (3) muodostuu ulommasta kerroksesta (6), johon käytetyn polymeerin sulamispiste on vähintään 230 °C, sekä kuitumateriaalikerrosta (5) vasten olevasta sisemmästä kerroksesta (7), jossa polymeeria, jonka sulamispiste on vähintään 230 °C, on seostettu toiseen, adhesiiviseen polymeeriin, jonka sulamispiste on välillä 130-185 °C. Sisempään kerrokseen (7) voidaan lisäksi sisällyttää mineraalista ainetta, kuten kalsiumkarbonaattia. Kartongin (1) valmistus tapahtuu keksinnön mukaan päällekkäisten polymeerikerrosten (6, 7) koekstruusiolla. Keksinnön mukainen kartonki (1) soveltuu nestepakkaus- tai uunikartongiksi, ja kartongista valmistettavia tuotteita ovat etenkin uunivuoat sekä vuoan käsittävät sellaisenaan kuumennettavat elintarvikkeen kuluttajapakkaukset.